PB90-177841

Superfund Record of Decision (EPA Region 5): Windom Dump Windom, MN. (First Remedial Action), September 1989

(U.S.) Environmental Protection Agency, Washington, DC

29 Sep 89

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REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R05-89/116	2.	3. Recipient's Accession No. PB 90 177841/AS
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12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460			13. Type of Report & Period Covered 800/000
15. Supplementary Notes			14.

16. Abstract (Limit: 200 words)

The 11-acre Windom Dump site is a former municipal landfill in Windom, Cottonwood County, Minnesota. Land use in the vicinity of the site includes residential areas and commercial, industrial, and agricultural operations. City water supply wells northwest of the site lie downgradient of the landfill. Landfilling operations began in the 1930s and continued until 1974. During this period paint sludges from a large manufacturing operation were disposed of along with municipal refuse resulting in low levels of toxic substances contaminating an underlying aquifer, which is used as a water supply. The primary contaminants of concern affecting the ground water are VOCs including benzene, PCE, and TCE; metals including arsenic; and other inorganics.

The selected remedial action for this site includes grading and capping the fill area with a 2 foot clay cap overlain by one foot of granular material, topsoil, and new vegetation; modifying the existing municipal water plant by installing additional aeration nozzles and structure venting; and ground water monitoring. In the event that allowable contaminant limits are exceeded in the monitoring wells, a contingency plan including a ground water pump and treatment system will be implemented. The estimated present worth cost for this remedial action is $865,000, which includes an annual O&M cost of $5,700 for 30 years.

17. Document Analysis a. Descriptors

Record of Decision - Windom Dump, MN
First Remedial Action - Final
Contaminated Medium: gw
Key Contaminants: VOCs (TCE, PCE, benzene), metals (arsenic), other inorganics

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 52
	20. Security Class (This Page) None	22. Price A04

(See ANSI-Z39.18) See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R05-89/116
September 1989

PB90-177841

EPA

Superfund Record of Decision:

Windom Dump, MN

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

DECLARATION STATEMENT
RECORD OF DECISION

SITE NAME AND LOCATION

Windom Municipal Dump
Windom, Minnesota

STATEMENT OF BASIS AND PURPOSE

This decision document serves as United States Environmental Protection Agency's (U.S.EPA) concurrence with and adoption of the remedial action decision for the Windom Municipal Dump site, as selected by the Minnesota Pollution Control Agency (MPCA), and pursuant to section 117 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). MPCA approved this remedial action in conformance with the Minnesota Environmental Response and Liability Act; and it has provided U.S.EPA with documentation to demonstrate that the State's selection of the remedy generally conforms with the requirements of CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Contingency Plan, to the extent practicable.

The State has undertaken response action at the Windom Municipal Dump and has sought U.S.EPA concurrence in adoption of the remedy which has been selected. The U.S.EPA's concurrence with the State's selected remedy is based upon the items listed in the Attachment, and the adequacy and completeness of those documents as represented by the State.

DESCRIPTION OF REMEDIAL ACTION

The selected remedy provides for final cleanup requirements related to the Windom Municipal Dump site, as provided below:

* Close the landfill in accordance with MPCA Solid Waste Rules, which require grading and capping the site, in order to minimize leachate generation;

* Modify the existing water treatment plant by installing additional aeration nozzles and structure venting to protect the public drinking water supply and;

* No action will be taken to actively control contaminant migration. Groundwater monitoring will be conducted; and if established intervention limits are exceeded, a groundwater pump and treatment system will be installed.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

REPLY TO THE ATTENTION OF:

29 SEP 1989

5RA-14

Mr. Gerald L. Willet
Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

Dear Mr. Willet:

Enclosed is the U.S. Environmental Protection Agency's (U.S. EPA's) Declaration Statement which concurs and adopts the Record of Decision (ROD), completed by Minnesota Pollution Control Agency (MPCA) for the Windom Municipal Dump Site.

Our concurrence with and adoption of the ROD are based on the remedial action plan outlined within the ROD. It is the Agency's understanding that subsequent to your signing the ROD, the monitoring program at Windom Dump has detected higher concentrations of contaminants and further movement of the contaminant plume toward the city well field. Additional actions that are being considered include using the city well #7 as an extraction well and installation of an air stripper. The U.S. EPA recommends that the public be informed of continuing developments in this remedial action and request that the Agency is kept abreast of progress or developments in the remedial action.

Further, it is and will continue to be U.S. EPA's policy to utilize a 10^{-6} cumulative carcinogenic risk level as its point of departure. The Agency feels, however, that MPCA's adopted level of 10^{-5} may also be appropriate for the particular circumstances presented at this site.

We look forward to our continuing involvement on the Windom Municipal Dump Site.

Sincerely yours,

Valdas V. Adamkus
Regional Administrator

Enclosure

DECLARATION

Based on the information described above, U.S.EPA adopts and concurs with the remedy selected by the MPCA for the Windom Municipal Dump site. The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate for this remedial action, and is cost-effective. The ROD states that State solid waste management rules, which were in effect at the time Windom Landfill ceased operation in 1974, are applicable to this site. Further, requirements of Resource Conservation and Recovery Act (RCRA), 40 CFR Part 264, are considered by the State to be met. Subtitle C landfill closure requirements, however, are not deemed appropriate by U.S.EPA for the following reasons:

a. The majority of total wastes deposited was general municipal garbage.
b. Only low levels of toxic substances have been detected.
c. An endangerment assessment performed for the site concluded that it does not pose a significant threat to human health.

Finally, in addressing landfills specifically, the preamble of the draft National Contingency Plan (NCP) suggests that RCRA closure may not be appropriate where waste is of low toxicity and contamination is dispersed over a wide area that bears little resemblance to the discrete units regulated under subtitle C. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Because this remedy will result in hazardous substances remaining on-site, the State is expected to supply information such that the U.S.EPA can conduct a review, no less than 5 years after commencement of remedial action, to ensure that the remedy continues to provide adequate protection of human health and the environment. Also, the MPCA will inform the U.S. EPA if the intervention limits, which trigger the implementation of the groundwater pump and treat system, are exceeded.

U.S.EPA reserves the right to take enforcement actions under Sections 106 and 107 of the CERCLA against the Responsible Parties to assure that the remedy, as well as any necessary additional future work, is undertaken.

Sept. 29th, 1989
Date

Valdas V. Adamkus
Regional Administrator

FORMER WINDOM MUNICIPAL LANDFILL
WINDOM, MINNESOTA
RECORD OF DECISION

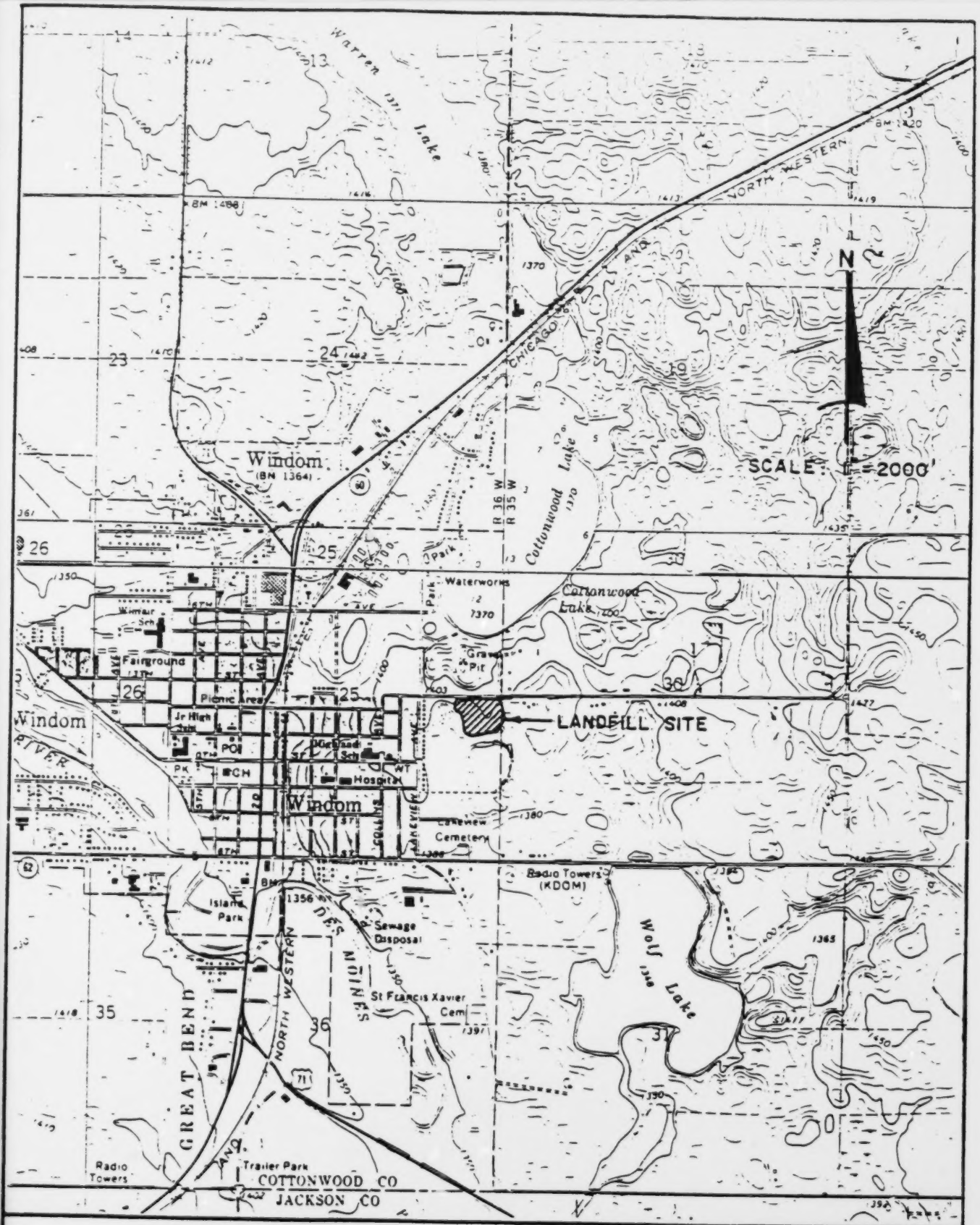
I. SITE NAME, LOCATION, AND DESCRIPTION

The City of Windom operated a municipal landfill from the 1930's to 1974. As shown on Figure 1, the landfill is located south of Thirteenth Street and east of Lakeview Avenue on the east side of the city.

The site is located in an abandoned sand/gravel pit covering an area of approximately 11.4 acres. Access to the site is off of Thirteenth Street with gates located at the northwest and northeast corners of the landfill. The site is secured to the north by a fence. To the east, the landfill is bordered by the Cottonwood County storage area which extends nearly 300 feet beyond the fill area and is secured by a fence. Residential lots along Lakeview Avenue are approximately 350 feet west of the fill area and are separated from the landfill by a fence. Several other single family residences are located about 400 feet to the northeast and east of the site outside of the city limits.

The area surrounding the former Windom Municipal Landfill is comprised of residential, commercial-industrial, and agriculture land. Beyond the county storage area to the east lies agricultural land used for growing hay and livestock grazing. The Windom Ready Mix plant and gravel pit operates 500 feet north of the landfill site. A recreational softball field and bicycle race course are located approximately 600 feet to the northwest of the site. A cemetery is located approximately 1,000 feet to the southwest. Historically, the land in the vicinity of the site had been used for agriculture, sand and gravel mining/cement tile works, and flax pile storage for the Kimberly-Clark Company.

A pond, surrounded by sparsely wooded grasslands, is located 100 feet



WINDOM LANDFILL SITE LOCATION MAP	E.A. HICKOK & ASSOCIATES HYDROLOGISTS - ENGINEERS MINNEAPOLIS - MINNESOTA	NOV. 1986 1

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south of the landfill. Other nearby surface waters include Cottonwood Lake, approximately 1,100 feet to the north, the Des Moines River, 3,500 feet to the southwest, Wolf Lake, 3,000 feet to the southeast, and Perkins Creek, 4,000 feet to the northwest.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. History

Prior to the beginning of refuse disposal, the landfill site was quarried for sand and gravel. The actual depth of excavation is not known. The elevation of Thirteenth Street, however, is approximately 1,400 feet (NGVD) and the ground water elevation is nearly 1,355 feet (NGVD). It is believed that a maximum 40 to 45 feet of sand and gravel were removed prior to landfilling. Hence, refuse was placed near, but above, the ground water table. The depth of excavation and waste disposal was confirmed to be above the ground water table during the Remedial Investigation (RI, Hickok and Associates, 1987).

A 1981 engineering report indicated that municipal refuse was placed in the landfill beginning in the 1930's (Bonestroo, 1981). No specific information is available regarding landfill operations for the time period from the 1930's to 1951. The Toro Company began operations in the City of Windom in the late 1940's. The Toro plant primarily manufactured lawnmowers and snowblowers and disposed of cardboard, wooden pallets, plastic casings, and paint sludge in the landfill.

Prior to 1971, all refuse was burned. It is believed that most of the paint sludges disposed of by Toro were burned. During the period 1971 to 1973, burning operations were ceased and the municipal refuse was placed along the western boundary of the disposal area. Toro discontinued its disposal operations in 1974 when the landfill was closed. The facility was operated as an unpermitted disposal area.

The Cottonwood County storage area east of the site was used as a gravel source by the County beginning in 1955 through 1958. Since 1965, the pit on the County property has been used to store new and used metal and concrete culverts, various items such as scrap iron, old plows, barrels, discarded fuel tanks, wood, tires and related materials commonly used by the County Highway Department. The County has stated that it has not stored or disposed of hazardous substances, pollutants, and contaminants at the storage site. An MPCA inspection, including sampling, determined that the county storage site is not a source of contamination.

B. Enforcement

In response to a complaint received by the Minnesota Pollution Control Agency (MPCA) in December 1980, the MPCA initiated an investigation of the former Windom Municipal Landfill. The complaint alleged that hazardous wastes may have been disposed of at the site. MPCA expressed concern that these hazardous wastes and other wastes disposed of at the facility may be a source of pollutants to the area surface water and ground water.

In a correspondence dated April 2, 1981, MPCA formally requested that the city prepare an investigation plan for the site. The City submitted a report in November 1981, in response to the MPCA request. The document was entitled "Report on Groundwater Monitoring Plan - City Dump" (Bonestroo, 1981). As presented in the plan, six monitoring wells/piezometers were installed near the perimeter of the landfill to determine the ground water flow direction and ground water quality.

In December 1983, the MPCA and the U.S. Environmental Protection Agency (EPA) reviewed the available data and completed a preliminary assessment for the site. Based on their review of the data, the agencies calculated a Hazard Ranking System score of 38 for inclusion of the site on the State

Superfund Permanent List of Priorities (PLP) and Federal Superfund National Priorities List (NPL).

Early in 1986, E. A. Hickok and Associates, Inc. (EAH) was retained by the City to independently assess the environmental conditions at the site through a review of existing data. This review was presented in a document entitled "Preliminary Assessment" which was submitted to the MPCA on April 4, 1987, (EAH, 1986). Limited field activities, including monitoring of ground water elevations, redevelopment and sampling of existing monitor wells, and sampling of nearby residential and municipal water supply wells were also conducted February through August 1986.

The MPCA issued a Request for remedial action (RFRA) to the City of Windom and the Toro Company on June 24, 1986, requiring the named Responsible Parties (City of Windom and Toro Company) to conduct a Remedial Investigation (RI) of the site. At the time of RFRA issuance, the City was already investigating the site.

A series of RI plans and reports were prepared by EAH and submitted to the MPCA in November 1986. Documents were revised in February 1987, to include MPCA requests for additional information and to incorporate changes in occupational safety and health regulations. Formal MPCA approval was granted on April 23, 1987. The RI documents submitted include:

"Evaluation Report for the Remedial Investigation," November 1986.

"Identification of General remedial action Alternatives for the Windom Landfill," November 1986.

"Work Plan for the Remedial Investigation," November 1986; revised February 1987.

"Quality Assurance Project Plan for the Remedial Investigation" November 1986; revised February 1986.

"Site Safety Plan for the Remedial Investigation," November 1986; revised February 1987.

"Site Security Plan for the Remedial Investigation," November 1986.

The site RI was initiated at the landfill in May 1987. Investigation activities included: completing eleven soil borings to determine on-site geology; constructing and developing twelve additional monitoring wells to better define ground water flow; completing eight refuse borings and sampling of soils to characterize the waste disposed at the site; conducting two rounds of water quality sampling at new and existing monitoring wells, municipal wells, and domestic wells to better define ground water quality; and ground water flow modeling to estimate aquifer characteristics and the influence of municipal well field pumping on ground water flow/contaminant transport in the area of the landfill site. The site investigation activities were completed in September 1987.

In September 1988 a report entitled "Feasibility Study - Former Windom Municipal Landfill, Windom, Minnesota" was prepared by Wenck Associates, Inc. and submitted to the MPCA in fulfillment of the Request for Response Action (RFRA) issued June 24, 1986. The Alternatives Report and Detailed Analysis Report required by the RFRA (Section VI, Exhibit A, Tasks A and C) were combined into this single document as read upon by MPCA and City of Windom representatives on July 1, 1988. This report identified and evaluated several remedial action alternatives for the Site in context of specific remedial action objectives. Alternatives which passed an initial screening process and a more detailed evaluation were recommended for implementation.

III. COMMUNITY RELATIONS

A public comment period for the Feasibility Study (FS) and the recommended alternative was open from January 10, 1989, to February 8, 1989. Copies of the RI and FS Reports, and a Fact Sheet detailing the alternatives

evaluated and the recommended alternative, were made available to the community at that time. The Windom City Hall serves as the information repository for the documents. MPCA issued a news release and placed a notice in the Windom newspaper announcing the public comment period and outlining the alternatives evaluated and the recommended alternative. A public meeting was held at Windom City Hall on January 17, 1989. No public comments were made at the January public meeting or received during the public comment period.

IV. SCOPE OF remedial actionS

The selected remedy represents the final remedial action for the Windom site. In addition, long-term ground water monitoring and a contingency plan for protecting the municipal water supply will be included in the Final remedial action Plan. As a result of this remedial action the principal threat at the site, ground water contamination, will be mitigated.

V. SITE CHARACTERISTICS

The following discussion summarizes the findings of the RI.

A. Ground Water

Ground water at the Site is located in glacial outwash deposits consisting primarily of sand and gravel. This aquifer is underlain by a thick clay layer which serves as a natural barrier to water flow and protects deeper aquifers from contamination. The saturated thickness of the sand and gravel deposit ranges from 50 to 150 feet. Depth to the water table about 50 feet from the ground surface.

The general ground water flow direction at the site is in a northwesterly direction. The ground water flow velocity in the vicinity of the landfill is estimated to range between 90 to 700 feet per year.

Water quality monitoring at the site has indicated that no surface water impacts have occurred; however, elevated concentrations of several

inorganic and volatile organic compounds have been detected in the ground water near the fill area. Volatile organic compounds found in the most significant concentrations near the fill area are the chlorinated ethylene compounds; 1,1,2,2-tetrachloroethylene (PCE); 1,1,2-trichloroethylene (TCE), cis-1,2-dichloroethylene (1,2-DCE); and vinyl chloride (monochloroethylene).

Various inorganic indicators have been detected slightly above background at various downgradient site perimeter wells. A notable exception is nitrate detected at as high as 15 mg/l. However, no clear trends in the data are evident at this time which would be indicative of leachate migration from the fill area.

B. City Well Field

City Water Supply Well 7 is located approximately 500 feet northwest of the landfill site screened at a depth of approximately 150 feet into the glacial aquifer. Computer flow modeling employed to simulate hydraulic conditions of the aquifer indicated that the radius of influence from pumping City Well 7 probably extends under the landfill site. Pumping of City well 7 generally induces a cone of depression with ground water flow moving radially toward the well. However, since the natural flow direction at the site is to the northwest, pumping of City Well 7 does not greatly alter ground water flow at the site.

1,2-DCE and vinyl chloride have been detected in untreated water at City Well 7 on several occasions. However, it is not clear whether or not the detections can be directly attributed to the landfill because monitoring well data, to date, indicate ground water impacts are limited to the immediate fill area.

1,2-DCE concentrations have been detected in untreated water at City Well 7 at levels up to 2.1 micrograms per liter (ug/l). The Recommended Allowable Limit (RAL) for 1,2-DCE is 70 micrograms per liter (ug/l).

On several occasions vinyl chloride levels in untreated water has equaled or exceeded the Maximum Contaminant Level (MCL) drinking water standard of 2 ug/l. However, vinyl chloride has not been detected in treated water in the City's distribution system although trace amounts of 1,2-DCE have been found below drinking water criteria. As a precaution, the City has installed enhanced aeration spray nozzles at its water treatment plant to remove volatile organic compounds through volatilization.

C. Soil/Refuse

Refuse borings conducted at the landfill site in the buried refuse area indicated the subsurface material to be a dark loamy organic soil that was mixed with chunks of concrete and rubble. No soil staining was observed below the refuse in the burned refuse area. Borings conducted on the edge of burned areas and unburned areas indicated soil staining to depths 8 to 15 feet below the refuse. Chemical analysis of soils collected below the refuse indicated metals to be present in concentrations slightly above background at nonhazardous levels. No EPA organic priority pollutants were detected in soil samples, except for di-n-butylphthalate, ranging in concentrations from 330 to 1,600 milligrams per kilogram (mg/kg). Di-n-butylphthalate is a widely used plasticizer compound in the manufacturing of plastics, textiles, cosmetics, insecticides, and coatings/adhesives.

D. Air Quality

Air quality monitoring was also conducted during the RI. Monitoring did not indicate any extended releases of organic vapors or methane above

background at the site which may have been hazardous to on-site workers. No detectable vapors or methane was detected at the perimeter of the site.

VI. SUMMARY OF RISKS

The landfill has been identified as a source of inorganic and organic contaminants in the local ground water beneath the landfill site. Other possible sources of contaminants to the ground water in the vicinity of the landfill have not been verified as actual sources.

The concentrations of contaminants found in monitoring wells in the fill area and untreated water from one municipal well (City Well 7) have exceeded State Applicable or Relevant and Appropriate Requirements (ARARs) as shown in Table 1.

The RI conducted during May through September 1987 has determined that the only significantly affected media at the site is the ground water of the glacial drift aquifer. No contamination of the ambient air or local surface waters have been found and only insignificant levels of contaminants were found in the soils below the refuse. Hence, the only mechanism for transport of chemicals from the site is the ground water of the glacial drift aquifer. It is believed that deeper aquifers are protected due to the presence of a thick clay layer underlying the site. This thick clay would be expected to be a confining layer to both ground water flow and contaminant transport.

As previously discussed, the ground water of the glacial drift aquifer is used in the vicinity of the landfill for a variety of purposes. The primary use is for water supply. Thus, the only pathway of concern for human exposure to the contaminants would be from ingestion of the ground water.

Several residences east and south of the Site rely on domestic wells for human consumption. Water quality analysis indicates that these wells are unaffected by contaminated ground water under the landfill. Residences west of

the Site are supplied with city water and any associated wells are believed to be used only for nonhuman consumption purposes. The city well field consists of five wells and is located downgradient of the fill area, with the city water supply well 7 located nearest to the site. This well field supplies the entire population of the City of Windom, approximately 5,900 people, with potable water (approximately 12 to 24 million gallons per month).

Several inorganic and organic constituents have been identified in the ground water beneath the fill area.

The inorganic compounds which have been detected at levels significantly above background include ammonia, nitrate and arsenic. Ammonia is not a concern for this health assessment because as ammonia migrates from the reducing conditions beneath the fill to a more oxidizing environment away from the fill, ammonia transforms into nitrate. Hence, before ammonia reaches a point of exposure, it would most likely be in the form of nitrate. Thus, the health risk assessment for nitrogen compounds focuses on nitrate.

The nitrate concentrations have been detectable within the fill area up to 2.6 mg/l. At the perimeter wells nitrate concentrations have generally ranged as high as 4.6 mg/l. Concentrations above 10 mg/l drinking water standard at perimeter wells have been found on two occasions but have not been confirmed by recent sampling. Samples and water supply samples do not indicate the presence of nitrate. Thus, the exposure dose to humans due to nitrate was found to be insignificant.

Arsenic concentrations at the fill area did on a few occasions exceed the 50 ug/l drinking water standard. Arsenic has been designated by EPA as a human carcinogen. However, arsenic was not detected at the perimeter wells or at City Well 7.

Arsenic would not be expected to migrate away from the fill area due to near neutral pH conditions of the ground water. Neutral pH conditions are generally not conducive to mobilizing heavy metals in ground water. Hence, the exposure dose to populations from arsenic through consumption of drinking water was found to be insignificant.

Volatile organic compounds (VOC's) have also been detected at elevated concentrations near the fill area. The VOC's that have been identified in significant concentrations which may have toxic or carcinogenic effects from exposure include PCE, TCE, 1,2-DCE, vinyl chloride and benzene. A summary of concentrations detected are presented in Table 1. These compounds, particularly 1,2-DCE and vinyl chloride, have exceeded drinking water standards or criteria on many occasions at monitoring wells in the fill area.

Only trace amounts of 1,2-DCE have been detected at the perimeter of the site. This suggests that volatile organic compounds have not migrated away from the landfill. Migration is probably being attenuated through various natural processes.

Even though it does not appear that contaminants are presently migrating beyond the fill area, untreated water from City Well 7 has shown the presence of two volatile organic compounds, 1,2-DCE and vinyl chloride. Concentrations in untreated water samples from City Well 7 have been detected up to 2.1 and 5 ug/l, respectively, for 1,2-DCE and vinyl chloride. Vinyl chloride on several occasions has equaled or exceeded the Maximum Contaminant Level of 2 ug/l in untreated water. 1,2-DCE has remained well below the Recommended Allowable Limit (RAL) of 70 ug/l. See Table 1.

Although these two compounds have been detected, the likelihood of human exposure is negligible. The 1,2-DCE concentrations are well below established drinking water criteria. Vinyl chloride has been detected at or slightly above

the federal drinking water standards on several occasions in untreated water. Vinyl chloride has been designated by EPA as a carcinogen.

The presence of vinyl chloride and 1,2-DCE at the observed concentrations in untreated water at City Well 7 does not pose a significant threat to human health at this time for several reasons:

1. Health risks associated with vinyl chloride occur over an extended period of time (i.e. lifetime exposure of 70 years). Based on the monitoring period of record, there does not appear to be a long history of vinyl chloride being present at City Well 7.

2. City Well 7 is used only 7 to 10 days each month. Thus there was a very limited exposure to the compound over an annual period, if any exposure was, in fact, occurring.

3. Vinyl chloride and 1,2-DCE, due to their high volatility, are probably stripped and further diluted to safe levels as it passes through the filtration and distribution system. To date, vinyl chloride has not been detected in treated water in public distribution system.

4. Volatile organic compounds which reach Well 7 are further removed by the modified treatment system (aeration nozzles) prior to reaching the distribution system.

5. If vinyl chloride and 1,2-DCE begins to consistently appear in City Well 7 and the present water treatment system is not successful in treating these levels in the distribution system, additional action will be taken such as closing down the well or improving the water treatment system to prevent vinyl chloride from reaching the public.

Drinking water criteria for VOC's has not been exceeded in treated water in the distribution system. Thus, the estimated exposure to humans from VOC's was found to be insignificant.

Although elevated concentrations of inorganic and organic contaminants have been detected in ground water beneath the landfill, the contaminants leaching from the fill do not appear to have migrated to any human exposure point. Monitoring well data does not indicate that contaminants are migrating off-site. Hence the present risk to human health associated with the landfill itself is negligible. If contaminants are observed to be migrating in significant concentrations from the fill area in the future, the risk to humans would increase because the city water supply wells are located downgradient of the landfill.

VII. DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes have been made since the publication of the FS and Proposed Plan.

VIII. DESCRIPTION OF ALTERNATIVES

The main objective for remedial actions is to abate or minimize ground water contamination and prevent migration of volatile organic compounds from the Site and thereby protect the aquifer and the city of Windom's water supply. The Feasibility Study report prepared by Wenck Associates (dated September 1988) assessed fourteen technologies as possible remedial action alternatives (see Table 2). These remedial action technologies are categorized under three main objectives; 1) protect the municipal water supply, 2) minimize leachate generation, and 3) control contaminant migration.

IX. INITIAL SCREENING OF ALTERNATIVES

After fourteen remedial action technologies for the three objectives were identified, the remedial action alternatives were then assessed and screened. Table 3 is a summary of the initial screening which briefly states the advantages or disadvantages of each alternative remedial action. Costs associated with various remedial actions are given by Table 4.

X. FINAL SCREENING OF ALTERNATIVES AND SUMMARY OF COMPARATIVE ANALYSIS

Table 5 presents the results of the final alternative screening process and the reasons for rejecting or retaining the remedial action alternatives under consideration.

Alternatives were further evaluated using the following criteria based on U.S. EPA guidance for Records of Decision (ROD):

* Reduction of Toxicity, Mobility, and Volume - This criterion evaluates the anticipated performance of treatment alternatives.

* Long-Term Effectiveness - This criterion evaluates the long-term protection of human health and the environment at the completion of remedial action. It is assessed in the magnitude of residual risks, adequacy of controls in achieving cleanup criteria, and reliability of controls against possible failure.

* Short-Term Effectiveness - The effectiveness of alternatives in protecting human health and the environment during implementation of remedial action is evaluated by this criterion. Short-term effectiveness is assessed by protection of the community, protection of workers, environmental impacts, and time until protection is achieved.

* Implementability - This assessment evaluates the technical and administrative feasibility of alternatives and the availability of services and materials.

* Overall Protection of Human Health and the Environment - This assessment draws on the results of the above evaluations to describe whether, and how, each alternative provides protection of human health and the environment.

* Compliance with ARARs - The assessment against this criterion describes how the alternative complies with ARARs, or if a waiver is required and how it is justified.

* Cost - The estimated capital, annual maintenance and monitoring, and present worth value costs are evaluated by this criterion. Present worth costs are calculated using a ten percent discount rate over a 30-year period of operation. Cost estimate summaries of alternative remedial actions are given in Table 4.

* State Acceptance - The State of Minnesota (MPCA) is the lead agency for the site.

* Community Acceptance - Community acceptance to the alternatives is included in this Record of Decision (ROD).

The remedial action alternatives which passed the initial screening process were evaluated in depth using the criteria described above in a comparative analysis. The results of this process are summarized in Table 6. In sum, this process gave the highest ratings to the following three recommended remedial actions; protect the municipal water supply by modifying the existing water treatment plant, minimize leachate generation by site capping, and control contaminant migration by ground water pump out and leachate treatment (Table, 6 alternatives 1B, 2B and 3B, respectively). The following discussion evaluates the three recommended remedial actions.

A. Protect Municipal Water Supply by Modifying the Existing Water Treatment Plant -

Reduction of Toxicity, Mobility, and Volume (TMV) -

As stated in the description of this alternative, the two contaminants found in City Well 7 (vinyl chloride and 1,2-DCE) are highly volatile. Pressure spray nozzles will break the raw water into fine droplets, thereby increasing the surface area of the water for greater water-air contact. In addition to the spray nozzles, power ventilators will increase the rate of airflow through the system and provide greater air-water contact. The combination of these two measures have been shown to effectively remove volatile compounds including vinyl chloride and 1,2-DCE. Effectiveness will be demonstrated through performance monitoring. Should contaminant drinking water criteria be exceeded in the distribution system, modification of the existing treatment system or implementation of an additional treatment system will be required.

Short and Long-Term Effectiveness -

As part of the overall water treatment system, the modifications would be useful for an indefinite period of time. Individual

components such as spray nozzles, vents, or blowers may need to be replaced periodically, but the overall effectiveness of the treatment would not be altered.

Implementability-

The proposed modifications are relatively simple and would require parts that can be readily obtained through equipment vendors. Operation of the system would only require additional electrical supply to power the ventilators. The operation of the modifications would be considered very reliable. Infrequent replacement of individual components may be required, but these parts can easily be obtained thereby minimizing maintenance downtime.

The modifications employ the same technologies utilized in spray irrigation systems and air stripping systems which have successfully been used for ground water cleanup at other sites.

Implementation of the proposed modifications would result in the release of low concentrations of volatile organic compounds to the atmosphere. No adverse environmental impacts are expected as a result of the modifications given the low concentrations involved.

During implementation and maintenance of the treatment system, the flow of water would temporarily be shut off. Hence the risk of workers being exposed to the volatile organic compounds would be minimal. The power ventilators would release the volatile organic compounds to the atmosphere thereby minimizing the risk of worker exposure during routine operation. Given the low concentrations of volatile organic compounds currently observed in the water supply, no adverse effects are expected. Calculations demonstrating the low risk of exposure are presented below. No fire or explosion threats are anticipated.

Water leaving the treatment plant must not exceed the water quality standards set forth in Minn. Rules ch. 7050 and the U.S. Primary Drinking Water Standards (40 CFR, Part 141).

Protection of Human Health and the Environment -

By implementing the proposed modifications, VOC's would be removed from the city water supply thereby minimizing the risk of exposure through ingestion. Volatile organic compounds removed from the water would be vented to the atmosphere. However, given the low concentrations of VOC's in the water, concentrations in the atmosphere are not expected to present a significant health risk, as discussed in the following section. Furthermore, the water treatment plant is located in a relatively undeveloped area (i.e., no residential homes or businesses); therefore, the exposure risk would be minimized. Any air emissions as a result of the modification would be below relevant requirements. Monitoring of the distribution system will continue and a contingency plan to modify or enhance the treatment system will be implemented if drinking water criteria are exceeded.

Compliance with ARARs -

Safe Drinking Water Act (SWDA); 40 CFR Parts 141-146. The SDWA sets forth maximum contaminant levels for contaminants in public drinking water supplies. The Windom Municipal Well Field is downgradient of the landfill. However, no MCL, have been exceeded within the distribution system. Furthermore, the city has installed several additional spray nozzles which will increase volatilization of volatile organic compounds in the event they should reach the water supply well.

Below is a comparison of potential air emission concentrations to Threshold Limit Values (TLV's) for 1,2-DCE and vinyl chloride.

Assume volatile organic compounds completely volatilize from water. Assume design air:water ratio is 20:1.

Maximum cis-1-,2-dichloroethene concentration detected at City Well 7 is 2.1 ug/l, to date.

2.1 ug/l x 1,000 l/m^3 x 1 mg/1,000 ug = 2.1 mg/m^3.

2.1 mg/m^3 /20:1 dilution factor in air = 0.11 mg/m^3 in exhaust air.

Threshold Limit Value for 1,2-dichlorethene is 790 mg/m^3 in air for eight-hour time-weighted average (ACGIH, 1988).

Therefore, the theoretical maximum 1,2-dichloroethene concentration in air exhaust is about 7,000 times below the acceptance maximum air concentration not taking into account dispersion in the atmosphere.

Maximum vinyl chloride concentration detected at City Well 7 is 5 ug/l, to date.

5 ug/l x 1,000 l/m^3 x 1 mg/1,000 ug = 5 mg/m^3.

5 mg/m^3 /20:1 dilution factor in air = 0.25 mg/m^3 in exhaust air.

Threshold Limit Value for vinyl chloride is 10 mg/m^3 in air for eight-hour time-weighted average (ACGIH, 1988).

Therefore, the theoretical maximum vinyl chloride concentration in air exhaust is about 40 times below the acceptable maximum air concentration not taking into account dispersion in the atmosphere.

The above calculations may need updating if VOC levels increase. Treatment of VOCs in the vapor phase may also be required in the future.

Costs -

Costs for modifying the water treatment plant are summarized in Table 4. Costs for implementing the modifications are relatively small. Most of the operation and maintenance costs are associated with monitoring to demonstrate treatment efficiency.

State Acceptance -

For protection of the municipal water supply, the MPCA staff has selected the alternative consisting of a modification of the existing water treatment plant. This alternative has already been voluntarily implemented at the plant by the city of Windom.

Community Acceptance -

A public comment period for the Feasibility Study (FS) and the recommended alternative began on January 10, 1989. Copies of the RI and FS Reports, the Fact Sheet detailing the alternatives evaluated and the recommended alternative, were made available to the community at that time. The Windom City Hall serves as the information repository for the documents. MPCA issued a news release and placed a notice in the Windom newspaper announcing the public comment period and outlining the alternatives evaluated and the recommended alternative. A public meeting was held on January 17, 1989, at Windom City Hall. No public comments were received during the 30 day public comment period.

B. Minimize Leachate Generation by Site Capping -

Reduction of Toxicity, Mobility, and Volume -

Capping the site is intended to minimize infiltration of precipitation with use of low-permeability compacted clay. The effectiveness of the cap will be enhanced through grading of the site to a minimum slope of two percent to promote surface water run-off. The site will be revegetated thereby increasing the effectiveness of the cap through proper stabilization of the cover and erosion control.

Short and Long-Term Effectiveness -

The useful life of a cap is uncertain, however, the anticipated design life is estimated to be greater than 30 years. The useful life of the cap will be maintained through proper long-term postclosure care of the site.

Implementability -

Capping is known to be a reliable technology for preventing infiltration of precipitation into wastes. Closure which includes capping is to be completed at landfills under MPCA Solid Waste Management Rules (Minn. Rules pt. 7035.2815), and thus is considered to be the best practical technology for minimizing leachate generation.

Grading and capping of the site can be easily implemented. Site capping activities can be performed using heavy equipment which is readily available such as graders, bulldozers, and rollers. The soil materials such as native clay for the cap and sand and gravel for drainage layers are also readily available nearby.

Postclosure care is necessary to ensure proper function of the cap. The cap must be inspected periodically to check for settlement, erosion, ponding of precipitation, and breaching.

It is estimated that the time to implement this option would be nine months. This period would include time for topographic surveying of existing site conditions, preparing a grading plan, designing the cap, preparing plans and specifications and bidding documents, soliciting bids, selecting a contractor, and actual construction.

Closure activities of the site will be in conformance with the Minn. Rules pt. 7035.2815. Approval from the county or township may also be needed dependent upon the location of the borrow area for clay or other soil materials.

Protection of Human Health and the Environment -

Capping of the site would have beneficial impacts to public health by minimizing further ground water impacts from the site. During construction, no significant safety concerns are expected. Physical hazards for

workers will exist due to moving equipment on-site. Fugitive dust emissions will occur during grading, however, these emissions will be controlled as necessary by watering the site. No chemical hazards are expected since wastes are not expected to be disturbed during the grading of the site. However, the site safety plan for construction will need to address any contingencies in the event of chemical hazards being encountered.

Capping the site would also be beneficial to the environment by having positive impacts on local water quality. Closure would improve the aesthetic appearance of the site. During grading, measures such as placement of silt fences should be taken to prevent run-off of sediment into surface waters until the vegetative cover is established.

Compliance with ARAR's -

Installing a designed cap in accordance with Minn. Rules pt. 7035.2815 will minimize leachate generation and reduce ground water contamination. Subpart 6.C of this rule calls for a 2 foot compacted clay barrier layer overlain by a 1 foot layer of granular material and topsoil.

Costs -

Costs for grading and capping the site are summarized in Table 4. Grading costs will be highly dependent upon the final grading design and the amount of earthwork required. Costs for the cap are highly dependent upon the proximity of the clay borrow area to the site. Proper grading and establishment of a vegetative cover should also minimize annual operational and maintenance costs to repair the cap.

State Acceptance -

The MPCA staff has selected the installation of a clay cap, in accordance with Minn. Rules pt. 7035.2815 as the remedial alternative for reducing leachate generation.

Community Acceptance -

A public comment period for the Feasibility Study (FS) and the recommended alternative began on January 10, 1989. Copies of the recommended alternative, were made available to the community at that time. The Windom City Hall serves as the information repository for the documents. MPCA issued a news release and placed a notice in the Windom newspaper announcing the recommended alternative. A public meeting was held on January 17, 1989, at Windom City Hall. No public comments were received during the 30 day public comment period.

C. Control Contaminant Migration by Ground Water Pump Out And Treatment -

Reduction of Toxicity, Mobility, and Volume -

If intervention limits in monitoring wells are exceeded in the future, a ground water pump out/treatment system would be installed between the well field and the landfill to intercept contaminants migrating from the landfill. Pump tests show that wells can be designed and constructed so that the cone of depression would intercept contaminants migrating from the landfill. TMV of the contaminants would be reduced by a treatment system which would be designed to handle the pump out water.

Continued monitoring for intervention limits (Table 7) in monitoring wells and residential wells around the perimeter of the Site is sufficient at this time to assure that further remedial action would be implemented in a timely fashion, if the ground water resource or municipal well field are impacted by future contaminant releases from the Site.

Short and Long-Term Effectiveness -

If implemented the life of the ground water pump out system would be designed based upon the time necessary to remediate the ground water to

acceptable levels. This would be dependent upon the extent and magnitude of contamination at the time of implementation.

Controlling contaminant migration through ground water pump out and treatment has been shown to be effective at many sites across the United States. One such site is the Washington County Sanitary Landfill No. 1 in Lake Elmo, Minnesota. At that site a gradient control well system was implemented to capture contaminated ground water found to be moving in the direction of a residential area which used the aquifer for water supply.

The effectiveness of any such system would be demonstrated through pilot testing as well as ongoing monitoring of ground water and treatment system discharges.

Implementability -

Operation and maintenance requirements would include winterizing the system, to prevent freeze-up of pumping, piping, or treatment facilities in order to ensure year-round operation, normal maintenance and replacement of parts such as pumps may be necessary periodically to ensure maximum operation efficiency. If an on-site treatment scheme is used such as spray irrigation, then maintenance of the treatment area soils would be needed periodically to ensure proper infiltration.

A ground water pump out and treatment system can be easily implemented. Materials are readily available from vendors and drillers for installing pumping wells and treatment facilities. No special problem would be anticipated with constructing such a system at this site.

An estimated four months would be needed to implement such a system from the time a ground water control system is deemed necessary. This would include time for studies, system design, construction, as well as

permitting. Continued ground water monitoring would be necessary to determine the length of time to operate the system.

Regulatory approval from the MPCA would be needed to implement the system as well as Minnesota Department of Health for construction of wells and the Minnesota Department of Natural Resources for appropriation of the ground water.

Protection of Human Health and the Environment -

Implementation of a ground water pump out system, if intervention limits are exceeded, would benefit public health. The pump out system would control the movement of contaminants, thereby preventing migration to points of use. Monitoring of volatile organics in the air would also need to be conducted, dependent upon the treatment system used, in order to ensure no exposure of the public to air-borne contaminants.

No significant safety concerns are anticipated with construction. A remedial action site safety plan would address the need for proper personal protective equipment during drilling of pump out wells.

Ground water pump out would benefit the environment by removing contaminants and controling contaminant migration, and thus protect the ground water resource. No significant negative impacts to the environment are anticipated from this type of system. Water levels would need to be monitored in the area to ensure private wells are not affected by ground water drawdown at the pumping wells. Influence on other production wells in the area would be addressed during the design phase of such a system.

Compliance with ARAR's -

In order to protect public health and the environment from contaminant migration in the future, the intervention limits and standards as

set forth in Minn. Rules pt. 7035.2815, Subp. 4.F shall apply. Table 7 presents a partial listing of intervention limits for compounds of major concern at the Site.

Minn. Rules pt. 7050.0220 requires that discharges to ground water which will be used for consumption attain MCLs and RALs for drinking water. The ground water pump out system, if implemented, would not discharge to the ground water. However, contaminants would be drawn from the landfill leachate into the ground water. Any contaminants however, would be treated by the pump out system, thus the ARAR would be attained.

Any discharge of pump out water to surface waters shall be required to meet the provisions of Minn. Rules pt. 7070 and a National Pollutant Discharge Elimination System (NPDES) permit shall be obtained.

Costs -

Costs for this alternative are summarized in Table 4. Construction costs are highly dependent upon the number of wells and the type of treatment system. These factors would be determined precisely during a design phase. It is anticipated that the least expensive treatment scenario for both capital and annual operation and maintenance costs would be spray irrigation, as opposed to treatment and discharge to the storm or sanitary sewer system.

State Acceptance -

The MPCA staff has selected the ground water pump out system remedy as the selected remedy if in the future it is determined that such a system should be installed.

Community Acceptance -

A public comment period for the Feasibility Study (FS) and the recommended alternative began on January 10, 1989. Copies of the RI and FS Reports, the Fact Sheet detailing the alternatives evaluated and the recommended

alternative, were made available to the community at that time. The Windom City Hall serves as the information repository for the documents. MPCA issued a news release and placed a notice in the Windom newspaper announcing the public comment period and outlining the alternatives evaluated and the recommended alternative. A public meeting was held January 17, 1989, at Windom City Hall. No public comments were received during the public comment period.

XI. SELECTED ALTERNATIVES

Based on the screening process, and the detailed review in consideration of the evaluation criteria (Table 6), the MPCA staff selects the recommended alternatives as the most appropriate final remedy for the Windom Landfill Site. This remedy is divided into three alternative remedial action objectives as discussed below.

Objective 1) Protect Municipal Water Supply -

This alternative called for modifications to the existing water treatment plant as previously described. These modifications have already been implemented. The modifications enhance volatile organic compound removal during the water treatment process. Raw and treated water were tested monthly for three consecutive months for the presence of volatile organic compounds after implementation of the modifications. These tests have demonstrated the removal efficiency of the modified water treatment process is successful in meeting drinking water standards. Quarterly testing is now performed and the system will continue to be evaluated as part of the Remedial Action Plan/Closure Plan (RAP/CP). The RAP/CP will provide any further recommendations to be performed if necessary to achieve greater efficiency, or recommended actions to pursue another alternative to protect the municipal water supply if results of the modifications are not effective.

Objective 2) Minimize Leachate Generation -

It is recommended that the site be closed in accordance with MPCA Solid Waste Rules, which require grading and capping the site. Implementation of this alternative may eliminate the need for implementing ground water pump out and treatment systems in the future. The grading plan, cap and cover design, as well as methods for construction and timetable will be presented as part of the RAP/CP.

Objective 3) Control Contaminant Migration -

At this time it is recommended that no action be taken with regard to active control of ground water at the site. Currently, no significant ground water impacts are apparent at the Site perimeter wells. Thus no significant benefits would be gained with regard to improvement of ground water quality at the Site for the amount of cost incurred.

However, the RAP/CP will include a contingency plan which would be implemented if, in the future, any single intervention limit is exceeded at any Site perimeter well or monitored residential well. Table 7 presents a list of intervention limits for compounds of major concern. The contingency plan shall require quarterly sampling of the perimeter and nearby residential wells. After every quarterly sampling event of these wells, the analytical results shall be compared to the intervention limits. If subsequent sampling results indicate that any single intervention limit is exceeded for the same parameter at the same well during the next two quarterly sampling events (exceedence for a total of three consecutive quarters), a Work Plan for a ground water pump out system shall be submitted to the MPCA within sixty (60) calendar days of such determination. The Work Plan shall include an implementation schedule for the pump out system. Ground water pump out and treatment shall continue for the duration specified in the approved Work Plan.

XII. STATUTORY DETERMINATIONS

A. Protection of Human Health and Environment

The selected remedy is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. The selected remedy protects public health by modification of the municipal water treatment system to remove any volatile organic compound which may be contained in the ground water supply. The treatment system will maintain, at a minimum, a risk no greater than 10^{-5} cumulative lifetime excess cancer risk and concentrations less than the MCL. The risk of exposure to contaminants volatized by the treatment system is less than 10^{-5} risk criteria. This system will remain effective as long as proper maintenance and monitoring occur. The landfill capping remedy is protective of human health and the environment. Capping will reduce infiltration and thereby reduce the risk of ground water contamination. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

B. Attainment of ARAR's

The selected alternatives will meet the following federal and state ARAR's:

1. Resource Conservation and Recovery Act (RCRA); 40 CFR Part 264. RCRA (40 CRF Part 264) requires the removal of all waste residues and soil contaminated with hazardous waste. However, RCRA has not defined the level of decontamination required. EPA guidance requires that any contaminants left in subsoils will not impact any environmental media. The cap will further reduce and control any minor amounts of VOCs remaining in the subsoils that may move

downward through the soil column and enter the shallow ground water beneath the Site. A ground water pump out/treatment alternative has been prepared for implementation in case shallow ground water becomes contaminated.

2. Clean Water Act (CWA); 40 CFR Parts 122 and 125.

Treated ground water will be utilized by the municipal water supply. No water is planned for discharge to surface waters at this time.

3. Safe Drinking Water Act (SDWA); 40 CFR Parts 141-146.

The SDWA specifies MCLs for contaminants at public drinking water supplies. The ground water beneath the Site is near the capture zone of the Windom City Well 7, however, a treatment system is already in place for the water supply. The Windom water supply is currently meeting MCLs.

4. Minn. Rules pt. 7035.2815.

State solid waste management rules are applicable to this Site. These regulations became effective in 1970 and were revised in 1973. They were in effect at the time the Windom landfill ceased operation in 1974. New solid waste management rules promulgated in 1987 and amended in 1988, have interim requirements for landfills closed within 18 months of the effective date (i.e., before May 15, 1990). It is anticipated the interim requirements will be applicable for the remedial actions at this Site.

Closure of the former Windom Municipal Landfill is expected to be completed by September 1989. The final cover to be installed and closure certification of the Site is designed to be in conformance with those rules.

The application of the ground water intervention limits and standards set by Subpart 4.F. will protect the environment and is consistent with the State ground water protection strategy based on the goal of nondegradation of ground water resources.

5. Minn. Stats. 115 and 116 and Minn. Rules chs. 7001 and Minn. Rules pt. 7050.021.

There is no discharge to surface water in the alternatives being implemented at this time.

6. Minn. Rules pt. 7050.0220.

This rule requires that discharges to ground water which will be used for consumption attain MCLs and RALs for drinking water. The selected alternative will not discharge to ground water, however as stated previously, minor amounts of VOCs may move downward through the soil to the ground water within the capture zone of the pump out system where they will be removed and treated.

7. Minn. Stat. § 116.07, subd. 4.A.

The operation of the aeration nozzles (air stripper) will not require an air quality permit under this statute, which regulates air emissions of toxic pollutants. The emissions have calculated and are well below the adverse impact level and therefore do not require additional control measures.

Where State ARARs are more stringent than Federal ARARs, the State requirements will be met at the completion of the remedial action.

C. Cost-Effectiveness

All costs have and will be borne by the Responsible Parties under terms of the existing RFRA.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The MPCA has determined that the selected remedy is the most appropriate solution for meeting the remedial action goals at the Windom Dump Site. The selected remedy provides the best balance among the evaluation criteria (Table 6). The selected remedy is a permanent solution that uses alternative treatment technologies to the maximum extent practicable.

E. Preference for Treatment as a Principal Element

The statutory preference for remedies that employ treatment which permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances as a principal element is satisfied since the contaminants transferred to the air will be degraded by naturally occurring processes.

XIII. SCHEDULE

The remedial action for the Site is expected to be implemented in accordance with the following schedule:

- Execute ROD and approve FS — April 1989
- Approve remedial action Plan — April 1989
- Implement remedial action — May 1989
- Site Closure Certification — September 1989

TABLE 1

SUMMARY OF CONCENTRATIONS DETECTED
FOR ASSESSING HEALTH RISK

FORMER WINDOM MUNICIPAL LANDFILL

Compound	ARAR*	Background	Fill Area	Perimeter	City Well 7 (untreated)
Nitrate-Nitrogen (mg/l)	10.0	<0.05	<0.05-2.6	<0.05-15?	<0.05
Arsenic (ug/l)	50	<5	<1-75	<5	<5
1,1,2,2-Tetrachloroethylene (PCE) (ug/l)	(6.6)	<1.0	<1.0-48	<1.0-5.6?	<1.0
1,1,2-Trichloroethylene (TCE) (ug/l)	5	<1.0	<1.0-35?	<1.0	<1.0
1,2 cis Dichloroethylene (DCE) (ug/l)	(70)	<1.0	<1.0-730	<1.0-1.2	<1.0-2.1
Vinyl Chloride (ug/l)	2	<1.0	<1.0-210	<1.0	<1.0-5
Benzene (ug/l)	5	<1.0	<1.0-21?	<1.0-32?	<1.0

Note: Levels of all listed compounds in treated water in the public distribution system after treatment have not been detected above ARAR's.

*ARAR's include Maximum Contaminant Levels, MCL, and Recommended Allowable Limits, RAL. RAL's are denoted by parentheses.

Background = Well nest MW-7

Fill Area = MW-5, 5A, and 6

Perimeter = MW-1,2 and well nests MW-8, 9, and 10

< = Less than

? = High range of data unconfirmed by subsequent sampling

Based on data available as of March 1989.

TABLE 2

REMEDIAL ACTION ALTERNATIVES

FORMER WINDOM MUNICIPAL LANDFILL

GENERAL REMEDIAL ACTION	TECHNOLOGIES
OBJECTIVE 1: PROTECT MUNICIPAL WATER SUPPLY	
No Action	-Monitoring
Water Treatment	-Modifications to existing plant
	-Packed tower air stripper
Alternate Water Supply	-Abandon water supply well/ Construct new well
OBJECTIVE 2: MINIMIZE LEACHATE GENERATION	
No Action	-Monitoring
Source Control	-Site capping -Removal and off-site disposal -In-situ solidification/ stabilization -Removal and on-site disposal
OBJECTIVE 3: CONTROL CONTAMINANT MIGRATION	
No Action	-Monitoring
Pumping	-Ground water pump out/treatment
In-situ Treatment	-Bioreclamation
Subsurface Barriers	-Slurry walls/Grout curtains/Sheet piling
Subsurface Drains	-Interceptor systems

Based on: "Feasibility Study - Former Windom Municipal Landfill, Windom, Minnesota," Wenck Associates, Inc., September 1988.

TABLE 3

ALTERNATIVE REMEDIAL ACTION
INITIAL SCREENING SUMMARY
FORMER WINDOM MUNICIPAL LANDFILL

REMEDIAL ACTION ALTERNATIVE	ADVANTAGES/DISADVANTAGES
OBJECTIVE 1: PROTECT MUNICIPAL WATER SUPPLY	
No Action	Potential exposure to contaminants.
Modifications to Water Treatment Plant	Easily and quickly implemented at a low cost ($11K). Effectiveness needs to be demonstrated through monitoring.
Air Stripper Unit	Proven technology and easily implemented but at a much higher cost ($84K). Additional operation and maintenance costs to be incurred.
Relocate New Well	Additional subsurface geologic, hydrogeologic, and chemical testing and studies necessary to site well. Capital costs similar to an air-stripper unit but much lower operation and maintenance costs.
OBJECTIVE 2: MINIMIZE LEACHATE GENERATION	
No Action	Continued generation of leachate and impacts to ground water.
Site Capping	Effective proven technology. Site grading necessary. Lowest cost alternative ($300-800K).
Removal and Off-Site Disposal	Effective in controlling source. Potential impacts to air quality during excavation (fugitive dusts and vapors). Strict following of MPCA, RCRA, DOT and OSHA regulations required. Adequate and willing disposal facility to be located. Long-term liability incurred for wastes at another facility. High transport and disposal costs.
Removal and On-Site Disposal	Effective technology. Potential impacts to air quality during excavation (fugitive dusts and vapors). Lengthy and detailed permitting process. High costs for construction of facility - 1 to 2 orders of magnitude greater than site capping.

TABLE 3 (continued)

REMEDIAL ACTION ALTERNATIVE
INITIAL SCREENING SUMMARY
FORMER WINDOM MUNICIPAL LANDFILL

REMEDIAL ACTION ALTERNATIVE	ADVANTAGES/DISADVANTAGES
On-Site Stabilization/Solidification	Extensive testing required prior to implementation to test feasibility. High costs of 1 to 2 orders of magnitude greater than site capping.
OBJECTIVE 3: CONTROL CONTAMINANT MIGRATION	
No Action	Potential increase in magnitude and extent of ground water impacts.
Ground Water Pumpout and Treatment	Effective and proven technology. Permits needed for disposal of ground water dependent upon disposal alternative. Long-term operation and maintenance costs.
In-situ Treatment	Not effective for all types of organic compounds such as chlorinated compounds. Feasibility would need to be tested through pilot testing.
Subsurface Barriers	Effective and proven technology for shallow applications. Would need to be implemented in conjunction with other remedial action such as pumpout system or drains. Potential incompatibility of chemicals with barrier materials.
Subsurface Drains	Effective for shallow contamination problems in low-hydraulic conductivity aquifers. Generally used in conjunction with subsurface barriers.

Based on: "Feasibility Study - Former Windom Municipal Landfill, Windom, Minnesota," Wenck Associates, Inc., September 1988.

TABLE 4

COSTS OF ALTERNATIVE RESPONSE ACTIONS

MODIFICATIONS TO WATER TREATMENT PLANT

Construction Costs

Equipment and Materials		$ 5,000
Labor for Installation		4,000
	Subtotal	9,000
Contingency (10%)		1,000
Engineering (10%)		1,000
ESTIMATED CAPITAL CONSTRUCTION COST		$ 11,000

Annual Operation and Maintenance Costs

Labor for Increased Cleaning	$ 600
Electrical Power	500
Monitoring	1,600
ESTIMATED ANNUAL COST	2,700
PRESENT WORTH OF ANNUAL COST*	$ 25,000

Summary of Present Worth Costs

Total Estimated Capital Construction Cost	$ 11,000
Total Estimated Annual Present Worth Cost*	25,000
TOTAL ESTIMATED COST	$ 36,000

*Based on a 10 percent discount rate for a 30-year operation period

TABLE 4 (CONTINUED)

COSTS OF ALTERNATIVE RESPONSE ACTIONS

PACKED TOWER AIR STRIPPER UNIT

Construction Costs

Treatment Unit & Installation	$ 70,000
Contingency (10%)	7,000
Engineering (10%)	7,000
ESTIMATED CAPITAL CONSTRUCTION COST	$ 84,000

Annual Operation and Maintenance Costs

Labor/Materials	$ 1,000
Monitoring	2,000
Electrical Power	6,000
ESTIMATED ANNUAL COST	9,000
PRESENT WORTH OF ANNUAL COST*	$ 85,000

Summary of Present Worth Costs

Total Estimated Capital Construction Cost	$ 84,000
Total Estimated Annual Present Worth Cost*	85,000
TOTAL ESTIMATED COST	$169,000

*Based on a 10 percent discount rate for a 30-year operation period

TABLE 4 (CONTINUED)

COSTS OF ALTERNATIVE RESPONSE ACTIONS

CONSTRUCTION OF NEW WATER SUPPLY WELL

Construction Costs

Permanently Abandon City Well 7	$ 6,000
Site Selection Studies and Tests	15,000
Construct New Well	17,000
Connect New Well to Distribution System	38,000
Subtotal	$ 76,000
Contingency (10%)	8,000
Engineering (10%)	8,000
ESTIMATED CAPITAL CONSTRUCTION COST	$ 92,000

Annual Operation and Maintenance Costs

1. Labor/Materials	$ 500
2. Monitoring	1,000
ESTIMATED ANNUAL COST	1,500
PRESENT WORTH OF ANNUAL COST*	$ 14,000

Summary of Present Worth Costs

Total Estimated Capital Construction Cost	$ 92,000
Total Estimated Annual Present Worth Cost*	14,000
TOTAL ESTIMATED COST	$106,000

*Based on a 10 percent discount rate for a 30-year operation period

TABLE 4 (CONTINUED)

COSTS OF ALTERNATIVE RESPONSE ACTIONS

SITE CAPPING

Construction Costs

Site Preparation and Grading		$140,000
Clay Cap (18,000 CY compacted)		250,000
Cover and Top Soil		250,000
Seeding		20,000
	Subtotal	660,000
Contingency (10%)		70,000
Engineering (10%)		70,000
ESTIMATED CAPITAL CONSTRUCTION COST		$800,000

Annual Operation and Maintenance Costs

Inspections	$ 1,000
Cover Maintenance (Repairs)	2,000
ESTIMATED ANNUAL COST	3,000
PRESENT WORTH OF ANNUAL COST*	$ 29,000

Summary of Present Worth Costs

Total Estimated Capital Construction Cost	$800,000
Total Estimated Annual Present Worth Cost*	29,000
TOTAL ESTIMATED COST	$829,000

*Based on a 10 percent discount rate for a 30-year operation period

TABLE 4 (CONTINUED)

COSTS OF ALTERNATIVE RESPONSE ACTIONS

GROUNDWATER PUMPOUT AND TREATMENT

Construction Costs

Drill Wells (2 wells @ 140' deep)	$ 25,000
Pumps (15 hp)	6,000
Hardware (piping, flow meters, housing, spray irrigation)	10,000
Aquifer Testing	10,000
Permitting	10,000
Subtotal	61,000
Contingency (10%)	6,000
Engineering (10%)	6,000
ESTIMATED CAPITAL CONSTRUCTION COST	$ 73,000

Annual Operation and Maintenance Costs

Electrical Power	$ 15,000
Labor/Materials	2,000
Monitoring	15,000
Reporting	10,000
ESTIMATED ANNUAL COST	42,000
PRESENT WORTH OF ANNUAL COST*	$396,000

Summary of Costs

Total Estimated Capital Construction Cost	$ 73,000
Total Estimated Annual Present Worth Cost*	396,000
TOTAL ESTIMATED COST	$469,000

*Based on a 10 percent discount rate for a 30-year operation period

From: "Feasibility Study - Former Windom Municipal Landfill, Windom, Minnesota," Wenck Associates Inc., September 1988.

TABLE 5

REMEDIAL ACTION ALTERNATIVES
FINAL SCREENING RESULTS
FORMER WINDOM MUNICIPAL LANDFILL

Alternative	Screening Result	Reason
OBJECTIVE 1: PROTECT MUNICIPAL WATER SUPPLY		
1A No Action	Eliminated	Does not meet objective
1B Modifications to Treatment Plant	Retained	Low cost, potentially effective
1C Air Stripper	Eliminated	Cost is prohibitive
1D Relocate New Well	Eliminated	Cost is prohibitive
OBJECTIVE 2: MINIMIZE LEACHATE GENERATION		
2A No Action	Eliminated	Does not meet objective
2B Site Capping	Retained	Effective and relatively inexpensive
2C Removal/Off-site	Eliminated	Additional long-term disposal liability and high cost
2D Removal/On-site Disposal	Eliminated	Permitting concern, time to implement and high costs
2E On-Site Stabilization/ Solidification	Eliminated	Site-specific feasibility uncertain and high cost
OBJECTIVE 3: CONTROL CONTAMINANT MIGRATION		
3A No Action	Eliminated	If impacts appear downgradient of landfill, then it does not meet objective
3B Ground Water Pumpout/ Treatment	Retained	Effective technology
3C In-situ Treatment	Eliminated	Site-specific feasibility uncertain
3D Subsurface Barriers	Eliminated	Cost prohibitive at depths required for this site
3E Subsurface Drains	Eliminated	Ineffective for this site

TABLE 6

FORMER MUNICIPAL LANDFILL
WINDOM, MINNESOTA
CRITERIA EVALUATION

ALTERNATIVES GROUPED BY OBJECTIVE

Evaluation Criteria	(1) Protect Water Supply				(2) Minimize Leachate					(3) Control Migration				
	1A	1B	1C	1D	2A	2B	2C	2D	2E	3A	3B	3C	3D	3E
Short-Term Effectiveness														
Protection of Community	-	+	+	+	-	+	+	+	+	-	+	-	-	-
Protection of Workers	-	+	+	+	-	+	+	+	+	-	+	+	-	-
Environmental Impacts	-				-	+	-	-	-	-	+	+	-	-
Time					-									
Long-Term Effectiveness														
Magnitude of Residual Risks	-	+	+	+	-	+	+	+	-	-	+	-	-	-
Adequacy of Controls	-	+	+	+	-	+	+	-	-	-	+	-	-	-
Reliability of Controls	-	+	+	+	-	+	+	-	-	-	+	-	-	-
Reduction of Toxicity, Mobility, Volume	-	+	+	+	-	+	+	+	-	-	+	-	-	-
Implementability														
Technical Feasibility	-	+	+	+	+	-	-	-	-	-	+	-	-	-
Administrative Feasibility	-	+	+	+	+	-	-	-	-	-	+	-	-	-
Availability of Services and Materials	-	+	+	+	+	-	-	-	-	-	+	-	-	-
Cost		+	-	-		+	-	-	-		-	-	-	-
Compliance with ARARs	-	+	+		-	+	+	+	-	-	+	-	-	-
Overall Protection of Human Health and Environment	-	+	+	+	-	+	+	+	-	-	+	-	-	-
State Acceptance	-	+	-	-	-	+	-	-	-	-	+	-	-	-
Community Acceptance	-	+	-	-	-	+	-	-	-	-	+	-	-	-
TOTAL	-14	+14	+8	+7	-9	+9	+2	-3	-11	-14	+13	-11	-15	-15

Notes: + = generally favorable in comparison to other alternatives
- = generally unfavorable in comparison to other alternatives
blank space = neither favorable nor unfavorable

TABLE 6 (CONTINUED)

REMEDIAL ACTION CRITERIA EVALUATION
FORMER WINDOM MUNICIPAL LANDFILL

KEY FOR ALTERNATIVES

OBJECTIVE 1. PROTECT MUNICIPAL WATER SUPPLY

1A No Action

1B Modification of existing water treatment plant

1C Packed tower air stripper

1D Abandon water supply well/construct new well

OBJECTIVE 2. MINIMIZE LEACHATE GENERATION

2A No Action

2B Site capping

2C Removal and off-site disposal

2D Removal and on-site disposal

2E In-situ solidification/stabilization

OBJECTIVE 3. CONTROL CONTAMINANT MIGRATION

3A No Action

3B Ground water pump out/treatment

3C In-situ treatment

3D Subsurface barriers

3E Subsurface drains

TABLE 7

CONTINGENCY PLAN

PARTIAL LIST OF INTERVENTION LIMITS
FOR MONITORING WELLS

FORMER WINDOM MUNICIPAL LANDFILL

Compounds of Major Concern	Intervention Limit*
Nitrate - Nitrogen (mg/l)	2.5
Arsenic (ug/l)	12.5
1,1,2,2-Tetrachloroethylene (PCE) (ug/l)	1.7
1,1,2 Trichloroethylene (TCE) (ug/l)	7.8
1,2 cis Dichloroethylene (DCE) (ug/l)	17
Vinyl Chloride (ug/l)	0.037
Benzene (ug/l)	3

*Intervention limits for compounds not found on this list are found in Minnesota Solid Waste Management Rules Part 7035.2815, Subp. 4.F.

DECLARATION

SITE NAME AND LOCATION

Former Windom Municipal Landfill Contamination Site
Windom, Minnesota

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Former Windom Municipal Landfill Contamination site developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300).

This decision is based upon the contents of the administrative record for the Former Windom Municipal Landfill Contamination Site.

DESCRIPTION OF THE SELECTED REMEDY

The final ground water remedy for the site was developed to protect public health and the environment by minimizing migration of contaminants from the landfill to the ground water.

The major components of the selected remedy are as follows:

- Installation of an aeration system at the Windom municipal water treatment plant;
- Capping the landfill with a cover system consisting of a 2 foot compacted clay barrier layer, overlain by a .5 foot sandy drainage layer, a .5 foot layer of topsoil;
- Long-term ground water monitoring; and
- Installation of a ground water pump out/treatment system in the event that intervention limits are exceeded in monitoring wells.

DECLARATION

The selected remedy is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate for this remedial action, and is cost effective. The remedy utilizes permanent solutions and alternatives or resource recovery technologies to the maximum extent practicable for the clay cap and municipal water aeration treatment system. A ground water pump out/treatment system is not needed at this time but will be installed if intervention limits are exceeded in monitoring wells.

Gerald L. Willet
Commissioner
Minnesota Pollution Control Agency

4/7/89
Date